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ABSTRACT

This paper presents a comprehensive evaluation framework for a variety of organizations that wish to find the perfect fit between the needs of the organization and the online solutions they adopt. The framework described in this paper is an outcome of a collaborative effort between the department of Instructional Design, Development and Evaluation (IDD&E) of Syracuse University and one of the leading companies in the Northeast that provides training and development for large and mid-size corporations. A brief overview of the e-Learning project is provided, followed by a discussion of the different dimensions of the proposed evaluation framework. The paper concludes with a description of the utilization of evaluation framework and discussion of future directions. (Author/AEF)

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A Framework for Evaluation & Selection of E-Learning Solutions

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Abstract: This paper presents a comprehensive evaluation framework for a variety of organizations that wish to find the perfect fit between the needs of the organization and the online solutions they adopt. The framework described in this article is an outcome of a collaborative effort between the department of Instructional Design, Development, and Evaluation (IDD&E) of Syracuse University and one of the leading companies in North East that provides training and development for large and mid-size corporations.

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Introduction

In the last years of the twentieth century, the world of education has changed. Use of the Internet has grown dramatically in training and education. Internet and related technologies have changed the way we communicate and have provided unprecedented access to information. It has also changed our expectations of education – how, when, where, and in what form we expect to access opportunities for learning. As a result, educational institutions are now faced with tough decisions about which learning technologies to adopt. Not only educational organizations but also business and industry are struggling to select the online training solution that fit their organizational and technical requirements.

On the other hand, when speaking of online learning environments, one often begins to feel lost. Vendors of e-learning related products employ a variety of terms to describe their products. Moreover, different vendors do not necessarily mean the same thing when they use the same terms. Many terms are used interchangeably, and sometimes one term is used to mean different things. With so many terms, it is difficult to distinguish the different types of learning environments. An organization wishing to select an environment that is appropriate to its needs often finds itself in the situation of comparing apples and oranges, as the products and features being compared really have little in common. In an attempt to ease the process and to provide some basis for comparison, a number of different evaluation frameworks have been proposed. However, existing frameworks either do not provide tools for a spectrum of different online learning environments or they have simply stayed behind of the new developments in the field.

The aim of this paper is to present a more comprehensive evaluation framework for a variety of organizations that wish to find the perfect fit between the needs of the organization and the online solutions they adopt. The framework described in this article was developed as a result of a collaboration project between the department of Instructional Design, Development, and Evaluation (IDD&E) of Syracuse University and one of the leading companies in North East that provides training and development for large and mid-size corporations.

The following section provides a brief overview of the eLearning project. Then the different dimensions of the proposed evaluation framework are discussed. The paper concludes with the description of the utilization of evaluation framework followed by discussions on future directions.

The eLearning Project

The eLearning project is an outcome of an initial understanding between a leading provider of training and development for large and mid-size corporations and the department of IDD&E at Syracuse

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University. As a response to demands from business and industry, this company felt the need to extend its services by consulting in the area of online training. The resulting project, i.e., the eLearning project, called for a collaborative engagement between a higher education institution and the industry. The task as set out was to identify and evaluate existing online learning products so that the company would be able to recommend the best blend of online learning solutions to its customers.

The initial project proposal was for seven months starting in June 2001. The effort was broken into six cyclical phases:

1. Project management
2. Identification of existing e-learning products
3. Initial review of e-learning products
4. Categorization
5. Evaluation
6. Reporting and dissemination

Internet is heavily utilized during the second and third phases, where we identified an overwhelming amount of e-learning related products and a number of Web sites that provide information about them. As each product was identified, the project members reviewed the demo version of the product as well as the information at the product's Web site and at the other Web sites. This initial review phase resulted with a report including the following information for each product identified:

- Product name
- Vendor information
- URL
- History
- Trends Info
- Learning approach
- Functionality
- Standards
- Experiences with demo version

During the initial review, it became obvious that there was a need for a comprehensive evaluation framework that could take into account the diversity and richness of e-learning related products. Such a framework needed to be constructed so that it allowed comparison of similar products for the purposes of selecting the best possible solution given organization's online training needs. Many Web sites offer information about the features available in different e-learning products; however, any sort of categorization is usually lacking. Using such Web sites for the purposes of selecting an online learning solution means comparing the features of a series of random systems. We, on the other hand, were trying to develop a system that helps the organizations select the best blend of online learning solutions that meets their organizational and technical requirements. Therefore, the first dimension of the proposed evaluation framework deals with categorization of e-learning related products. This is discussed in the following section.

Categorization of E-Learning Related Products

From the initial review of existing e-learning products, two things were most evident. First of all, many terms were used interchangeably, and sometimes, one term was used to mean different things. With so many terms, it was difficult to identify the different types of elearning products. This terminology problem showed itself in the discourse of researchers and practitioners in the field. Therefore, in identifying different product categories, our first challenge was to examine different uses and definitions of the terminology in the field.

The second problem also concerned the use of terminology. This one, however, was related to how vendors viewed and marketed their products. In an attempt to distinguish themselves from each other, vendors used rather fancy terminology while describing their products. For instance, a product marketed as a total online learning solution was not providing a total solution at all. Broadbent (2001) argues the similar

point when she notes the different terms that vendors of Learning Management Systems (LMS) use to market their products. Some examples of these terms include learning portal, best-of-breed technology, an end-to-end solution, an e-learning solution, a truly blended e-learning solution, an integrated learning and management system, a breakthrough Learning Management System, revolutionary elearning tools, one powerful solution, a complete turnkey private distance learning solution, a global learning management solution, a learning solution, e-learning infrastructure technology, open learning environment, and of course, the total solution (Broadbent, 2001).

E-learning products display a great deal of diversity with respect to their capabilities and features. Any organization wishing to select an e-learning solution that is appropriate to its needs would find itself in the situation of comparing apples and oranges. It is significantly more profitable to compare similar products from a specific category of products that may meet organization's needs than to compare the features of a series of random products. Therefore, it was important for us to distinguish the different types of e-learning related products in order to provide some basis for evaluation and comparison. Therefore, the first dimension of the proposed evaluation framework concerns the categorization of elearning related products.

There are a number of categorization schemes proposed in the literature. A review of existing categorization schemes suggest that there is a need to develop a new categorization scheme. The reason is three-folds. First of all, due to rapid consolidations in the e-learning product market any categorization schemes that are more than two years old face the danger of being outdated. Especially, in the last few years, many product categories have disappeared due to consolidation or market forces. On the other hand, existing products' capabilities and features have greatly been expanded, therefore, necessitating new product categories.

Secondly, some of the existing categorization schemes are not useful for the purposes of comparison and selection. For instance, a categorization scheme based on the origin of the system may be an interesting study but it does not aid decision-making of organizations.

The third problem we observed with existing categorization schemes is that some of them do not suggest mutually exclusive categories. In such a categorization scheme, it is possible to place the same product in more than one category. As a result, CuseeMe, which is an online conferencing tool with no other features may sit beside Authorware, which is a multimedia authoring tool, and WebCT, which is an online course creation and delivery system. This is definitely not a desirable situation for the purposes of comparison.

Nevertheless, some of the existing categorization schemes were useful for they offer organizational and technical criteria that remain valid in the selection process. Also, existing categorization schemes helped us identify the terminology researchers use. After a careful analysis of the capabilities of nearly one hundred e-learning products, following categories are proposed:

1. Synchronous Learning Systems
2. Course Management Systems
3. Learning Management Systems
4. Total Solutions
5. Delivery Support Tools
6. Development Support Tools
7. WWW Publishing Tools
8. Media Creation Tools

Synchronous Learning Systems (SLS) are those that provide environments where learners and instructors interact in real time, often at a scheduled event, usually through audio- or video-conferencing. Some of these systems may also provide limited asynchronous capabilities as well as student management and progress tracking tools. An example of a synchronous system would be Centra Symposium.

The category of *Course Management Systems* (CMS), on the other hand, include those products whose primary focus is the development and delivery of asynchronous learning environments. CMS typically target educational institutions, offering lower cost and built-in content-creation tools. They generally offer varying levels of student management and progress tracking functionality. They rarely support third party software. Examples of CMS include Blackboard, WebCT, and TopClass.

The third category, *Learning Management Systems* (LMS) includes those environments whose primary focus is the management of learning. They do not provide content development tools but they do

support third party courseware. They are extremely scaleable, and content is usually stored in an enterprise-class SQL database. They are relatively expensive and are generally directed towards corporate clients. Examples of LMS include Docent and Saba.

The category of *Total Solutions* includes systems that are indeed complete online learning packages. These include a learning environment hosted by the vendor. In addition, the vendor may provide content or work with the organization's subject matter experts to develop content. The packages are tailored to meet the needs of each individual organization. Examples of Total Solution providers include eCollege, Embanet, and Convene.

Delivery and *Development Support Tools* are products that are not online learning environments. Rather, these are used to support either the delivery or the development of content. These include tools such as threaded discussion boards, online tests, chat or messaging systems. Examples of Delivery Support Tools include TeamScape, NetSynergy, WebTeach, NetMeeting, WebBoard, and Hot Potato online testing tool. Examples of Development Support Tools include ToolBook II Assistant, and Designer's Edge, an online instructional design support tool.

The category *WWW Publishing Tools* includes products that are used to create Web sites such as FrontPage and Dreamweaver.

The final category *Media Creation Tools* include graphic creation tools such as Photoshop, animation tools, audio and video tools, and virtual reality tools.

Evaluation Levels

During the fourth phase of the eLearning project, nearly one hundred products were categorized using the scheme described in the previous section. The next step was to develop the evaluation criteria for each category. After a through literature review coupled with the knowledge of product types in each category we adapted the evaluation scheme proposed by (Landon, 2001) so that it can be applied to the products in all categories.

The resulting evaluation scheme has three levels: (i) The learner support; (ii) the instructor/designer support; and (iii) the technical specifications.

The *learner support* level concerns with the tools and features available to learners. These include the evaluation of system's capabilities to support learners, such as tools for web browsing, asynchronous sharing, synchronous sharing, and learner management.

In similar fashion, the *instructor/designer support* level focuses on the tools and facilities available to instructors and course designers. These include system's capabilities to support instructors and course designers manage the overall course, lessons, the student data and administrative tasks.

The third level focuses on the *technical specifications* of the systems. These include server platform, client platform, limitations, and exit considerations, as well as pricing policy. All of these evaluation levels contain sub-categories into which the evaluation criteria are organized (Figure 1).

Figure 1. Three level of evaluation proposed for e-learning related products

Level I: The Learner Support	Level II: The Instructor/Designer Support	Level III: Technical Specifications
1. *Web Browsing*	1. *Course*	1. *Server Platform*
a. Accessibility	a. Course planning	a. RAM
b. Bookmarks	b. Course managing	b. Disk space
c. Multimedia	c. Course customizing	c. Windows NT server
d. Security	d. Course monitoring	d. Apple server
		e. Unix server
2. *Asynchronous Sharing*	2. *Lesson*	
a. E-mail	a. Instructional designing	2. *Client Platform*
b. BBS file exchange	b. Presenting information	a. Minimum level
c. Newsgroups	c. Testing	b. Target Level
3. *Synchronous Sharing*	3. *Data*	3. *Pricing*
a. Chat	a. Grading online	a. Start-up cost
b. Voice chat	b. Managing records	b. On-going cost
c. Whiteboard	c. Analyzing	c. Technical support
d. Application sharing	d. Tracking	
e. Virtual space		4. *Limitations of Package*
f. Group browsing	4. *Resource*	a. IMS compliance
g. Teleconferencing	a. Curriculum managing	b. Number of courses
h. Videoconferencing	b. Building knowledge	c. Number of students
	c. Team building	d. Number of connections
4. *Study Support Tools*	d. Building motivation	e. Other limitations
a. Self assessing		
b. Progress tracking	5. *Administration*	5. *Extra Considerations*
c. Searching	a. Installation	a. Options
d. Motivation building	b. Authorization	b. Exit considerations
e. Study skill building	c. Registering	
	d. Online Fees Handling	
	e. Server security	
	f. Resource monitoring	
	g. Crash recovery	
	6. *Help Desk*	
	a. Student support	
	b. Instructor support	

Utilization of the Evaluation Framework

During the eLearning project, around one hundred e-learning related products were organized into eight categories described earlier. The products in each category were then evaluated in all of the three evaluation levels. Table 1 provides a sample evaluation table for a few Course Management Systems (CMS). As seen in the table, each CMS is evaluated whether or not it possesses or supports certain functionality. Three possibilities exist:

1. The check mark (v) means, "Yes, the product possesses the feature"
2. An empty cell means, "No, it doesn't possess the corresponding feature nor does it support it"
3. 3rd means, "No, it doesn't provide that functionality but integration of that feature is possible via third party integration."

Table 1 provides a good overview of the results of evaluation of all of the products in the same category. It allows comparison of the products in each category at a glance. Yet, for the purposes of selecting a particular product, one may need more information on how the product supports certain functionality. That is why, the evaluation table is supplemented by a second table that provides detailed review along the categories in the evaluation scheme (see Table 2). This table allows more detailed comparison of the products.

The next step in eLearning project is to develop a Web-based Decision Support Tool. We will also continue to evaluate elearning related products as they become available. Certainly, we may need to update the products already in the database as new versions become available.

PRODUCTS / CRITERIA	CMS 1	CMS 2	CMS 3	CMS 4	CMS 5	CMS 6	CMS 7	CMS 8
	LEVEL I: LEARNER SUPPORT							
Web Browsing	**CMS 1**	**CMS 2**	**CMS 3**	**CMS 4**	**CMS 5**	**CMS 6**	**CMS 7**	**CMS 8**
Accessibility	v	v	v	v	v		v	v
Bookmarks	v	v	v	v	v	v	v	v
Multimedia	v	v			v	v	v	v
Security	v	v	v	v	v	v	v	
Asynchronous Sharing	**CMS 1**	**CMS 2**	**CMS 3**	**CMS 4**	**CMS 5**	**CMS 6**	**CMS 7**	**CMS 8**
E-mail	v	v	v	v	v	v	v	v
BBS file exchange	v	v	v			v	v	v
Newsgroups	3rd	v	v	v	v	v	3rd	v
Synchronous Sharing	**CMS 1**	**CMS 2**	**CMS 3**	**CMS 4**	**CMS 5**	**CMS 6**	**CMS 7**	**CMS 8**
Chat	v	v	v	v			v	v
Voice Chat		v	3rd				v	v
Whiteboard	v	v		v	v	v	3rd	v
Application Sharing	v	v		v		v		v
Virtual Space	v	v			v			
Group Browsing	v	v		v	v	v	v	v
Teleconferencing	v	3rd	v		v	v		v
Videoconferencing	v		v		v	v	3rd	v

Table 1. Sample evaluation table for Course Management Systems Category (names of the CMS are not disclosed)

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FEATURES/TOOLS	CMS X
	LEVEL I: LEARNER SUPPORT
Web Browsing	
Accessibility	Content can be developed in text -only version
Bookmarks	You can add web pages to your favorites list
Multimedia	Instructors and students can control synchronized multimedia courseware created in Asymetrix Toolbook and Macromedia Authorware. The multimedia authoring tools can be used to create courseware, which contains audio clips, video clips, animations, simulation, learning exercises and tests.
Security	There are two forms of security. Log-in security and class room security.
Asynchronous Sharing	
E-mail	Upon registration student can enter email. Not a requirement
BBS file exchange	Can add files onto Virtual Campus to load files.
Newsgroups	Virtual Campus can be used to share information
Synchronous Sharing	
Chat	Incorporates a text chat
Voice Chat	Voice chat is possible via integration of NetMeeting
Whiteboard	Objects and text from any Windows supported application can be pasted in to the whiteboard and shared by everyone in class. The floor holder can highlight, add, delete, or edit the whiteboard contents. Whiteboard contents can be saved or printed by everyone in class. In addition, instructor scrolling in whiteboard is synchronized on all student screens.

Table 2. Sample detailed review table for a Course Management System

Discussion

In this paper, a comprehensive evaluation framework for evaluation of e-learning related products was presented. The proposed framework had two dimensions. The first dimension concerns the categorization of e-learning related products. A total of eight, mutually exclusive categories were proposed: (i) synchronous learning systems; (ii) course management systems; (iii) learning management systems; (iv) total solutions; (v) delivery support systems; (vi) development support systems; (vii) WWW publishing tools; and (viii) Media creation tools. These categories do not only serve as the basis to evaluate and compare similar products but they also support the selection process. For instance, if an organization is rather small and do not have Web design and instructional design teams available, they should not base their online learning solutions on the last four categories. Rather, they should go for ready-made systems in the first four categories. However, if an organization do not have a large budget but do have web design and instructional design support then they may choose to go with the last four categories. The advantage with not using ready-made systems is the flexibility of creating a custom solution for organizational needs. They are cheaper but can prove to be more time-consuming. The analysis of the organizational and technical requirements and capabilities is important in making the initial decision on what kind of online learning solution the organization needs. This solution may come from a specific category as well as a blend of several categories.

The second dimension concerned the evaluation of the products in each category. Three evaluation levels were proposed: (i) the learner support level; (ii) the instructor/designer support level; and (iii) technical specifications. Each level contained a number of subcategories around which the evaluation criteria are organized.

The evaluation framework presented in this paper was developed to support the organizations in selecting the best blend of online learning solutions that meets their organizational and technical

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requirements. There is no one 'right' answer but there are simply better or poorer choices based on how well online learning solutions are selected to match both organizational and technical requirements (Jackson, 2001). The basic premise of the proposed evaluation framework was that organizations can make better choices in selecting online learning solutions if they evaluate and compare their options more accurately.

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